More Process Safety With "Dry Measuring Cell"

Pressure measurement in sanitary applications

In manufacturing processes for food, pharmaceutical and biotechnology products, safety for the consumer has the highest priority. In these processes, measurement technology delivers valuable information for high-quality and efficient production. For the specific requirements with respect to hygienic design, there are several things to consider with the measuring instruments. This article explains important correlations and presents a reliable pressure measurement solution.

JÜRGEN REISER

Pictures: Wika

PG43SA pressure gauge for sanitary applications

Pressure measuring instruments which are used in sanitary applications must be made from inert materials. For example, only measuring instruments which have wetted parts of high-quality stainless steel are used here. Also, the cases are made from corrosion resistant stainless steel, since the equipment is often cleaned from the outside.

Additional demands are also imposed in terms of the smoothness of the surfaces. In the standards, such as EHEDG Doc. No. 8, "Hygienic equipment design criteria", a roughness of Ra <0.8 µm is considered as sufficient for cleaning in place (CIP) processes. This applies particularly for the wetted surfaces, but also for the instrument's case. Certain processes in biotechnology demand an even lower surface roughness of Ra <0.4 µm. This requirement is easy to understand, since within the process, there must not be any point where particles or other constituent elements of the medium can be deposited.

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From such deposits, impurities can quickly cultivate—and these can endanger the entire process. Also, with a change in the medium, such deposits can become a problem: When the plant is cleaned and rinsed, they can only be removed with a very strong and expensive cleaning effort. In the worst case, this could even contaminate the following batch.

Process Connections—Dry Is Safe

Also the junction of the measuring instrument with the process, through the process connection, must not represent any risk from a hygienic point-of-view. Here, dead-space free, flush diaphragm solutions have proven effective. Through the relevant standards, such as DIN 11864, process connections which are particularly suited for sanitary applications have been defined.

Diaphragm seals assembled to the gauge, with the appropriate process connections, represent a further solution. Diaphragm seals separate the pressure measuring instrument, i.e. the pressure transmitter or pressure gauge, from the measuring medium. The isolation is achieved by means of a flexible metal diaphragm. The internal space between the diaphragm and the pressure measuring instrument is completely filled with a system fill fluid, which transmits the pressure

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to the measuring element of the measuring instrument. But not without risk: A rupture of the diaphragm could result in problems, since in such an event, the system fill fluid needed in a diaphragm seal could find its way into the manufacturing process.

A risk-free alternative is offered by the Wika model PG43SA pressure gauge, which has been designed specifically for sanitary applications. Unlike a diaphragm seal based solution, the PG43SA needs no system fill fluid, since it uses a "dry" measuring cell. The deflection of the diaphragm element is transmitted directly via a link to the movement. This translates the linear movement of the link in the mm range into a rotational movement of 0-270 angular degrees onto the pointer.

Through this design solution, the safety of process plants is considerably increased—and the risk of contamination of the medium by the system fill fluid is completely eliminated.

Certified Safety

The hygienic design of the PG43SA in sanitary applications is confirmed by an EHEDG certification. Furthermore, the PG43SA is 3-A marked based on a third party verification for conformance to the standard 74-05. In the respective standards, provisions for the design of the measuring instruments are precisely specified; e.g. in respect of the design of the surface of the instrument and wetted parts. For example, certain radius and diameter values must not be below defined minimums. The background is again the requirement for the cleaning in place of instruments and equipment connected to the process to be as easy, and yet as thorough, as possible—thus preventing the deposit and build-up of undesirable material, which would endanger the manufacturing process, e.g. of foodstuffs.

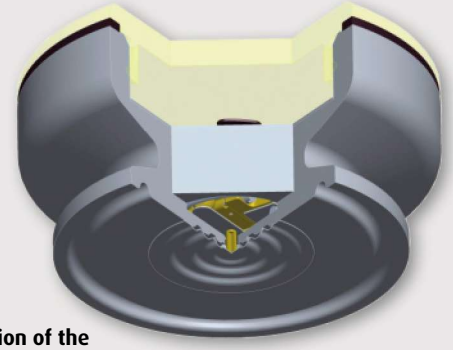
Trouble-free Cleaning

The reliable cleaning of those pipelines with measuring instruments fitted is enabled, trouble-free, with the PG43SA. The pressure gauge fulfills the regular requirement in this industry that measuring instruments also must be able to be cleaned 'in place'—thus as they are fitted. The required capability for CIP (Cleaning in Place) is realised by the PG43SA through a robust, dead-space free design and through the appropriate surface roughness of Ra ≤0.4 µm. With such a CIP cleaning, following the pre-rinse, which should have removed the large contaminants, cleaning with alkaline agents is carried out. The cleaning agent is then rinsed with water and any limescale there might have been is removed; finally the acid used is rinsed off and the process lines are flushed through with disinfectant and further rinsed with water. Following on from the CIP process is the SIP process (Sterilisation in Place). Here, hot steam at up to 150 °C is injected into the system in order to prevent any contamination of the process lines with water bacteria. This sterilisation lasts about 60 minutes. For these and other cleaning processes, the pressure measuring instrument does not need to be removed. The model PG43SA has a overpressure safety up to 40 bar without being damage to the diaphragm element. Thus the process line can be flushed at a sufficiently high pressure. Furthermore, the PG43SA can also be autoclaved, meaning it can be steam sterilised. This is enabled by, amongst other things, a special window from polysulphone, a plastic material which only expands slightly, even at high temperatures.

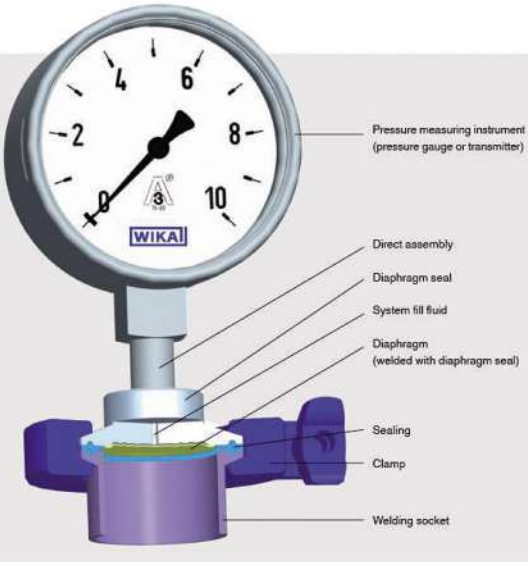
Versatile in Application

As well as pressure monitoring in process pipelines, the PG43SA can also be used for monitoring pressure in sterile vessels. This can include stainless steel vessels which are used for the transport of raw materials for drug manufacture or ingredients for drinks manufacture (such as fruit juice concentrates). Since the ingredients must not oxidise, following the aseptic filling, an inert gas (e.g. nitrogen) is added. Through this gas, a pressure of around 5 bar is present in the vessel. By monitoring with a PG43SA, the operator can determine, with one look, whether the vessel is still under pressure and therefore no leakage appeared and the transported goods are still suitable for usage.

Especially for these mobile containers, the very compact and robust instrument design in nominal sizes of 40 or 63 mm is extremely beneficial. By integrating the centre-back-mount process connection into the case, a space-saving mounting is ensured.



Cross-section of the PG43SA with "dry measuring cell"



Conventional solution: Pressure gauge with connected diaphragm seal